

2005 monitoring Summary



Emuckfaw Creek at State Highway 22 (33.0287/-85.6991)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Emuckfaw Creek watershed for biological and water quality monitoring as part of the 2005 Assessment of the Alabama, Coosa, and Tallapoosa (ACT) River Basins. The objectives of the ACT Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the ACT basin group.

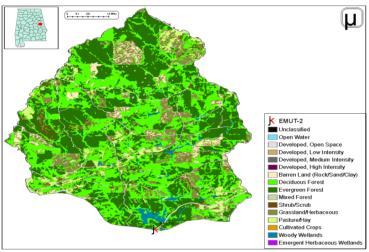


Figure 1. Sampling location and landuse within the Emuckfaw Creek watershed at FMUT-2

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Emuckfaw Creek is a small *Fish & Wildlife (F&W)* stream located near the city of Zana (Fig. 1). Landuse within the watershed is primarily forest (74%) and grassland. As of June 9, 2008, ADEM's NPDES Management System database did not show any permitted discharges located within the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and habitat assessments (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Emuckfaw Creek at EMUT-2 is a low-gradient, sand-bottomed stream in the Tallapoosa River basin. The presence of mixed forests and pasture/hay areas are characteristic of streams in the Southeastern Inner Piedmont (Table 1). Overall habitat quality was categorized as *marginal* due to limited instream habitat, poor sinuosity, increased sedimentation, and a lack of stable bank vegetation and stabilization.

Table 1. Summary of watershed characteristics.

Watershed Characteristics						
Drainage Area (mi ²)		50				
Ecoregion ^a		45a				
% Landuse						
Open water		<1				
Wetland	Woody	2				
Forest	Deciduous	36				
	Evergreen	38				
	Mixed	<1				
Shrub/scrub		1				
Grassland/herbaceous		12				
Pasture/hay		5				
Development	Open space	3				
	Low intensity	<1				
	Moderate intensity	<1				
	High intensity	<1				
Barren		3				
Population/km ^{2b}		7				
a Coutharn Innar Diadmont						

a.Southern Inner Piedmont b.2000 US Census

Table 2. Physical characteristics at EMUT-2, May 9, 2005.

Physica	ıl characteristi	es
Width (ft)		50
Canopy cover	N	Mostly Open
Depth (ft)		
	Run	2.0
	Pool	3.0
% of Reach		
	Run	60
	Pool	40
% Substrate		
	Gravel	3
	Sand	79
	Clay	2
	Silt	10
C	rganic Matter	6

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's <u>Intensive Multi-habitat Bioassessment methodology (WMB-I)</u>. The WMB-I uses measures of taxonomic richness, community composition, and community tolerance to assess the overall health of the macroinvertebrate community. Each metric is scored on a 100 point scale. The final score is an average of the score for each metric. Overall results of the assessment indicates the community to be in *good* condition.

Table 3. Results of the habitat assessment conducted May 9, 2005.

Habitat Assessment (% Maximum Score)		Rating
Instream habitat quality	41	Poor (<41)
Sediment deposition	44	Marginal (41-58)
Sinuosity	30	Poor (<45)
Bank and vegetative stability	43	Marginal (35-59)
Riparian buffer	90	Sub-optimal (70-90)
Habitat assessment score	119	
% Maximum score	54	Marginal (41-58)

Table 4. Results of the macroinvertebrate bioassessment conducted May 9, 2005

Macroinvertebrate Assessment Results				
	Results	Scores	Rating	
Taxa richness measures		(0-100)		
# Ephemeroptera (mayfly) genera	9	75	Good (71-85)	
# Plecoptera (stonefly) genera	6	100	Excellent (>75)	
# Trichoptera (caddisfly) genera	4	33	Poor (22-44)	
Taxonomic composition measures				
% Non-insect taxa	2	92	Excellent (>87.1)	
% Non-insect organisms	0	99	Excellent (>97)	
% Plecoptera	14	70	Excellent (>59.8)	
Tolerance measures				
Beck's community tolerance index	17	61	Good (60.7-80.4)	
WMB-I Assessment Score		76	Good (72-86)	

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected monthly, semimonthly (metals), or quarterly (pesticides, herbicides (atrazine), and semi-volatile organics) during March through October of 2005 to help identify any stressors to the biological communities. In situ measurements showed Emuckfaw Creek at EMUT-2 to be meeting established criteria for its F&W use classification. The site did not exceed numeric criteria for metals. However, median dissolved manganese concentrations were above expected values as based on the 90th percentile of reference reach data collected in ecoregion 45a.

CONCLUSIONS

Bioassessment results indicated the macroinvertebrate community to be in *good* condition. However, overall habitat quality was categorized as *marginal* due to poor instream habitat, sedimentation, low sinuosity, and a lack of bank vegetation and stability. Median dissolved manganese concentrations were above values expected in this ecoregion.

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Table 5. Summary of water quality data collected March-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value. Metals results were compared to ADEM's chronic aquatic life use criteria adjusted for hardness.

Physical Temperature (°C)	adjusted for hardness.							,	
Temperature (°C)		N		Min		Max	Median	Avg	SD
Turbidity (NTU)	Physical								
Total dissolved solids (mg/L)	Temperature (°C)	8		12.5		23.0	19.5	19.0	3.9
Total suspended solids (mg/L) 7 6.0 53.0 10.0 17.3 16. Specific conductance (μmhos) 8 17.6 33.1 28.2 28.1 4.1 Hardness (mg/L) 4 7.2 9.1 7.6 7.8 0.1 Alkalinity (mg/L) 7 8.2 28.4 9.8 12.2 7.3 Stream Flow (cfs) 6 32.1 85.2 75.0 66.7 Chemical Dissolved oxygen (mg/L) 8 7.8 10 9.3 9.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0	Turbidity (NTU)	8		4.8		33.2	6.9	10.7	9.3
Specific conductance (μmhos) 8 17.6 33.1 28.2 28.1 4.1 Hardness (mg/L)	Total dissolved solids (mg/L)	7		12.0		63.0	36.0	38.3	17.0
Hardness (mg/L)	Total suspended solids (mg/L)	7		6.0		53.0	10.0	17.3	16.3
Alkalinity (mg/L)	Specific conductance (µmhos)	8		17.6		33.1	28.2	28.1	4.8
Stream Flow (cfs)	Hardness (mg/L)	4		7.2		9.1	7.6	7.8	0.8
Chemical Dissolved oxygen (mg/L) 8 7.8 10 9.3 9.1 0.8 pH (su) 8 6.8 7.41 7.0 7.1 0.2 Ammonia Nitrogen (mg/L) 7 < 0.015	Alkalinity (mg/L)	7		8.2		28.4	9.8	12.2	7.2
Dissolved oxygen (mg/L) 8 7.8 10 9.3 9.1 0.3 pH (su) 8 6.8 7.41 7.0 7.1 0.3 Ammonia Nitrogen (mg/L) 7 0.015 0.028 0.008 0.013 0.00 Nitrate+Nitrite Nitrogen (mg/L) 7 0.037 0.092 0.072 0.072 0.072 Total Kjeldahl Nitrogen (mg/L) 7 0.015 0.281 0.075 0.135 0.00 Total nitrogen (mg/L) 7 0.094 0.232 0.109 0.146 0.00 Dissolved reactive phosphorus (mg/L) 7 0.004 0.005 0.002 0.003 0.00 Total phosphorus (mg/L) 7 0.004 0.071 0.044 0.039 0.00 CBOD-5 (mg/L) 7 0.004 0.071 0.044 0.039 0.00 Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.00 Total Metals	Stream Flow (cfs)	6		32.1		85.2	75.0	66.7	
PH (su)	Chemical								
Ammonia Nitrogen (mg/L) 7 < 0.015 0.028 0.008 0.013 0.00 Nitrate+Nitrite Nitrogen (mg/L) 7 0.037 0.092 0.072 0.072 0.07 Total Kjeldahl Nitrogen (mg/L) 7 0.094 0.281 0.075 0.135 0.00 Total nitrogen (mg/L) 7 0.094 0.232 0.109 0.146 0.00 Dissolved reactive phosphorus (mg/L) 7 0.004 0.005 0.002 0.003 0.00 Total phosphorus (mg/L) 7 0.004 0.071 0.044 0.039 0.00 CBOD-5 (mg/L) 7 1.0 4.8 1.6 1.9 1.3 Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.0 Total Metals Aluminum (mg/L) 4 < 0.015	Dissolved oxygen (mg/L)	8		7.8		10	9.3	9.1	0.8
Nitrate+Nitrite Nitrogen (mg/L)	pH (su)	8		6.8		7.41	7.0	7.1	0.2
Total Kjeldahl Nitrogen (mg/L) 7 < 0.150 0.281 0.075 0.135 0.00 Total nitrogen (mg/L) 7 0.094 0.232 0.109 0.146 0.00 Dissolved reactive phosphorus (mg/L) 7 < 0.004 0.005 0.002 0.003 0.00 Total phosphorus (mg/L) 7 < 0.004 0.071 0.044 0.039 0.00 CBOD-5 (mg/L) 7 < 1.0 4.8 1.6 1.9 1.9 Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.03 Total Metals Aluminum (mg/L) 4 < 0.015 0.284 0.172 0.159 0.14 Iron (mg/L) 4 0.900 1.110 0.968 0.987 0.00 Manganese (mg/L) 4 0.059 0.099 0.064 0.072 0.0 Dissolved Metals Aluminum (mg/L) 4 < 0.015 0.125 0.008 0.037 0.00 Dissolved Metals Aluminum (mg/L) 4 < 0.015 0.125 0.008 0.037 0.00 Cadmium (mg/L) 4 < 10 < 10 5 5 0.00 Cadmium (mg/L) 4 < 0.005 < 0.005 0.002 0.002 0.00 Chromium (mg/L) 4 < 0.005 < 0.005 0.002 0.002 0.00 Chromium (mg/L) 4 < 0.004 < 0.004 0.002 0.002 0.00 Chromium (mg/L) 4 < 0.005 < 0.005 0.002 0.002 0.00 Copper (mg/L) 4 < 0.004 < 0.004 0.002 0.002 0.00 Iron (mg/L) 4 < 0.003 0.086 0.056 Copper (mg/L) 4 < 0.036 0.086 0.056 Manganese (mg/L) 4 < 0.036 0.086 0.056 Manganese (mg/L) 4 < 0.036 0.086 0.056 Manganese (mg/L) 4 < 0.006 < 0.006 0.003 0.003 0.003 0.00 Mercury (μg/L) 4 < 0.006 < 0.006 0.003 0.003 0.00 Nickel (mg/L) 4 < 0.006 < 0.006 0.003 0.003 0.00 Selenium (μg/L) 4 < 10 < 10 5 5 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Ammonia Nitrogen (mg/L)	7	<	0.015		0.028	0.008	0.013	0.008
Total nitrogen (mg/L) 7 0.094 0.232 0.109 0.146 0.00 Dissolved reactive phosphorus (mg/L) 7 < 0.004 0.005 0.002 0.003 0.00 Total phosphorus (mg/L) 7 < 0.004 0.071 0.044 0.039 0.00 CBOD-5 (mg/L) 7 < 1.0 4.8 1.6 1.9 1.8 Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.03 Total Metals Aluminum (mg/L) 4 < 0.015 0.284 0.172 0.159 0.14 Iron (mg/L) 4 0.990 1.1110 0.968 0.987 0.00 Manganese (mg/L) 4 0.059 0.099 0.064 0.072 0.00 Dissolved Metals Aluminum (mg/L) 4 < 0.015 0.125 0.008 0.037 0.00 Antimony (μg/L) 4 < 0.015 0.125 0.008 0.037 0.00 Antimony (μg/L) 4 < 10 < 10 5 5 0 Cadmium (mg/L) 4 < 0.005 < 0.005 0.002 0.002 0.00 Chromium (mg/L) 4 < 0.004 0.004 0.002 0.002 0.00 Chromium (mg/L) 4 < 0.005 < 0.005 0.002 0.002 0.00 Iron (mg/L) 4 < 0.003 0.184 0.164 0.151 0.00 Lead (μg/L) 4 < 0.03 0.086 0.056 0.059 0.00 Mercury (μg/L) 4 < 0.3 < 0.3 0.15 0.15 0.0 Mercury (μg/L) 4 < 0.03 0.086 0.056 0.003 0.003 0.00 Selenium (μg/L) 4 < 0.006 < 0.006 0.003 0.003 0.00 Selenium (μg/L) 4 < 0.003 < 0.003 0.002 0.002 0.00 Thallium (μg/L) 4 < 0.003 0.003 0.002 0.002 0.00 Selenium (μg/L) 4 < 0.003 0.003 0.002 0.002 0.00 Thallium (μg/L) 4 < 0.003 0.003 0.002 0.002 0.00 Silver (mg/L) 4 < 0.003 0.003 0.003 0.002 0.002 0.00 Thallium (μg/L) 4 < 10 < 10 5 5 5 00	Nitrate+Nitrite Nitrogen (mg/L)	7		0.037		0.092	0.072	0.072	0.019
Dissolved reactive phosphorus (mg/L) 7 < 0.004 0.005 0.002 0.003 0.002 Total phosphorus (mg/L) 7 < 0.004 0.071 0.044 0.039 0.002 CBOD-5 (mg/L) 7 < 1.0 4.8 1.6 1.9 1.8 Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.03 Total Metals	Total Kjeldahl Nitrogen (mg/L)	7	<	0.150		0.281	0.075	0.135	0.082
Total phosphorus (mg/L) 7 < 0.004 0.071 0.044 0.039 0.00 CBOD-5 (mg/L) 7 < 1.0 4.8 1.6 1.9 1.9 1.9 Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.03 0.00 0.00 0.05 0.05	Total nitrogen (mg/L)	7		0.094		0.232	0.109	0.146	0.065
CBOD-5 (mg/L) 7 < 1.0	Dissolved reactive phosphorus (mg/L)	7	<	0.004		0.005	0.002	0.003	0.001
Chlorides (mg/L) 7 3.7 18.2 4.0 6.0 5.4 Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.0 Total Metals Aluminum (mg/L) 4 < 0.015	Total phosphorus (mg/L)	7	<	0.004		0.071	0.044	0.039	0.024
Atrazine (μg/L) 2 0.05 0.05 0.03 0.03 0.03 Total Metals Aluminum (mg/L) 4 < 0.015	CBOD-5 (mg/L)	7	<	1.0		4.8	1.6	1.9	1.5
Total Metals Aluminum (mg/L) 4 < 0.015	Chlorides (mg/L)	7		3.7		18.2	4.0	6.0	5.4
Aluminum (mg/L) 4 < 0.015	Atrazine (µg/L)	2		0.05		0.05	0.03	0.03	0.00
Iron (mg/L)	Total Metals								
Manganese (mg/L) 4 0.059 0.099 0.064 0.072 0.09 Dissolved Metals Aluminum (mg/L) 4 < 0.015	Aluminum (mg/L)	4	<	0.015		0.284	0.172	0.159	0.140
Dissolved Metals	Iron (mg/L)	4		0.900		1.110	0.968	0.987	0.089
Aluminum (mg/L) 4 < 0.015		4		0.059		0.099	0.064	0.072	0.019
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Dissolved Metals								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Aluminum (mg/L)	4	<	0.015		0.125	0.008	0.037	0.059
Cadmium (mg/L) 4 < 0.005	Antimony (µg/L)	4	<	2	<	2	1	1	0
Chromium (mg/L) 4 < 0.004	Arsenic (µg/L)	4	<	10	<	10	5	5	0
Copper (mg/L) 4 < 0.005 < 0.005 0.002 0.002 0.002 Iron (mg/L) 4 0.093 0.184 0.164 0.151 0.00 Lead (μg/L) 4 2 2 1 1 0.0 Manganese (mg/L) 4 0.036 0.086 0.056M 0.059 0.00 Mercury (μg/L) 4 < 0.3	Cadmium (mg/L)	4	<	0.005	<	0.005	0.002	0.002	0.000
Iron (mg/L)	Chromium (mg/L)	4	<	0.004	<	0.004	0.002	0.002	0.000
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Copper (mg/L)	4	<	0.005	<	0.005	0.002	0.002	0.000
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Iron (mg/L)	4		0.093		0.184	0.164	0.151	0.000
Mercury (μg/L) 4 0.3 0.15 0.15 0.0 Nickel (mg/L) 4 0.006 0.006 0.003 0.003 0.00 Selenium (μg/L) 4 10 10 5 5 0 Silver (mg/L) 4 0.003 0.002 0.002 0.002 Thallium (μg/L) 4 1 1 0.5 0.5 0.0	Lead (µg/L)	4	<	2	<	2	1	1	0.
Nickel (mg/L) 4 < 0.006	Manganese (mg/L)	4		0.036		0.086	0.056 ^M	0.059	0.025
Selenium (μg/L) 4 < 10	Mercury (µg/L)	4	<	0.3	<	0.3	0.15	0.15	0.00
Silver (mg/L) 4 < 0.003 < 0.003 0.002 0.002 0.002 Thallium (μg/L) 4 < 1 < 1 0.5 0.5 0.6	Nickel (mg/L)	4	<	0.006	<	0.006	0.003	0.003	0.000
Thallium (μg/L) 4 < 1 < 1 0.5 0.5 0.6	Selenium (µg/L)	4	<	10	<	10	5	5	0
" - "		4	<	0.003	<	0.003	0.002	0.002	0.000
7ing (mg/l) 4 2 0 000 1 0 000 0 000 0 000	Thallium (µg/L)	4	<	1	<	1	0.5	0.5	0.0
Zinc (ng/L)	Zinc (mg/L)	4	<	0.006	<	0.006	0.003	0.003	0.000
Biological	Biological								
J Chlorophyll a (mg/L) 6 < 0.10 12.28 2.67 3.66 4.4	J Chlorophyll a (mg/L)	6	<	0.10		12.28	2.67	3.66	4.46
^J Fecal Coliform (col/100 mL) 7 57 370 190 174 11	J Fecal Coliform (col/100 mL)	7		57		370	190	174	112

J=estimate; N=# samples; M=value > 90th percentile of all data collected within eco-region 45a